Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

Claim 1 (currently amended): An injection molding apparatus, comprising:

a manifold, said manifold having an inlet ~~for receiving melt from a melt source, said manifold~~ and defining a runner, wherein said runner is downstream from said inlet, and said runner is upstream from a manifold outlet;

a nozzle, said nozzle defining a nozzle melt channel, wherein said nozzle melt channel is downstream from said manifold outlet, wherein said nozzle includes a nozzle body, a nozzle tip, a seal piece, and a heater thermally connected to said nozzle body ~~for heating melt in said nozzle melt channel, said nozzle tip and said seal piece are connected with respect to said nozzle body;~~, wherein one of said seal piece and said nozzle tip is removably connected to said nozzle body and wherein said nozzle tip defines a portion of said nozzle melt channel~~, and wherein the thermal conductivity of said nozzle tip is higher than the thermal conductivity of said nozzle body, and wherein the thermal conductivity of said seal piece is lower than the thermal conductivity of said nozzle body~~;

a mold block defining a mold cavity~~, said mold block defining~~ and a gate into said mold cavity, wherein said gate is downstream from said nozzle melt channel, wherein said gate includes a gate sealing surface, said mold block having at least one cooling channel therein ~~for conveying a coolant threrethrough for cooling said mold cavity~~, wherein ~~said mold block and~~ said seal piece ~~engage each other to inhibit~~ engages said mold block and so that said seal piece and said mold block are capable of inhibiting melt leakage therebetween,

wherein a chamber is defined ~~between~~ by said mold block, said nozzle tip and said seal piece, ~~said chamber being positioned downstream from said nozzle melt passage and upstream from said gate~~, wherein said nozzle tip has sufficient surface area in said chamber such that said nozzle tip is capable of ~~to maintain~~ maintaining melt in said chamber in a substantially molten state;

a valve pin, wherein said valve pin is movable into and out of said gate ~~to control~~ such that said valve pin controls melt flow through said gate and into said mold cavity, wherein said valve pin has a bottom end~~, said valve pin has~~ and a valve pin sealing surface proximate said bottom end, said valve pin sealing surface ~~is~~ being engageable with said gate sealing surface ~~to inhibit melt flow into said mold cavity~~;

said valve pin having a first guidance and alignment structure ~~connected to said valve pin, wherein said first guidance and alignment structure includes~~ including a first guide surface and a first alignment surface, wherein said first guide surface has a cross-sectional diameter that decreases gradually in a downstream direction, and wherein said first alignment surface is generally cylindrical and said first guide surface is positioned immediately downstream from said first alignment surface; and

said mold block having a second guidance and alignment structure ~~connected to said mold block upstream from said gate, wherein said second guidance and alignment structure includes~~ including a second guide surface and a second alignment surface, wherein said second guide surface has a diameter that decreases gradually in a downstream direction, and wherein said second alignment surface is generally cylindrical and said second guide surface is positioned immediately upstream from said second alignment surface,

wherein said second guide surface is ~~positioned to engage~~ is capable of engaging said

first guide surface ~~to slide~~ and sliding said ~~valve pin~~ first alignment surface into alignment with said second alignment surface ~~gate when said valve pin is misaligned with said gate during movement of said valve pin towards said gate, and wherein said second guide surface is positioned to complete alignment of said valve pin with the gate prior to contact between said valve pin and said gate, wherein~~ and said second alignment surface ~~is positioned to engage~~ is capable of sliding along said first alignment surface ~~to maintain~~ and positioning said valve pin sealing surface in alignment with said gate sealing surface during movement of said valve pin towards said gate.

Claim 2 (currently amended): An injection molding apparatus as claimed in claim 1, wherein said ~~second~~ first guidance and alignment structure includes a relief channel that extends along at least a portion of said first guide surface and at least a portion of said first alignment surface.

Claim 3 (previously presented): An injection molding apparatus as claimed in claim 1, wherein said second guidance and alignment structure includes a relief channel that extends along at least a portion of said second guide surface and at least a portion of said second alignment surface.

Claim 4 (currently amended):. An injection molding apparatus as claimed in claim 1, ~~further comprising~~ wherein:

said valve pin has a third guidance and alignment structure ~~connected to said valve pin, wherein said third guidance and alignment structure includes~~ including a third guide

surface and a third alignment surface, wherein said third guide surface has a cross-sectional diameter that decreases gradually in a downstream direction, and wherein said third alignment surface is generally cylindrical and said third guide surface is positioned immediately downstream from said third alignment surface ~~and is downstream from said third alignment surface~~ and is upstream from said first alignment surface; and

said nozzle tip has a fourth guidance and alignment structure ~~connected to said nozzle tip, wherein said fourth guidance and alignment structure includes~~ including a fourth guide surface and a fourth alignment surface, wherein said fourth guide surface has a diameter that decreases gradually in a downstream direction, and wherein said fourth alignment surface is generally cylindrical and said ~~third~~ fourth guide surface is positioned immediately upstream from said fourth alignment surface and said fourth alignment surface is upstream from said second guide surface,

wherein said fourth guide surface ~~is positioned to engage~~ is capable of engaging said third guide surface ~~to slide~~ and sliding said ~~valve pin~~ said third alignment surface into alignment with said ~~gate~~ fourth alignment surface ~~when said valve when said valve pin is misaligned with said gate during movement of said valve pin towards said gate, and wherein said fourth guide surface is positioned to complete alignment of said valve pin prior to contact between said valve pin and said gate, wherein~~ and said fourth alignment surface ~~is positioned to engage~~ is capable of sliding along said third alignment surface ~~to maintain~~ and generally positioning said valve pin in alignment with said gate during movement of said valve pin towards said gate.

Claim 5 (original): An injection molding apparatus as claimed in claim 1, wherein said nozzle

tip is retained in said nozzle body by said seal piece.

Claim 6 (original): An injection molding apparatus as claimed in claim 1, wherein said nozzle tip is connected to said nozzle body by a threaded connection.

Claim 7 (currently amended): An injection molding apparatus as claimed in claim 1, wherein said seal piece is a first seal piece, and ~~wherein~~ said nozzle further includes a second seal piece disposed between ~~separates~~ said first seal piece and said nozzle tip ~~and seals therebetween to provide~~ such that ~~an airspace between~~ said first seal piece, said second seal piece, said nozzle body and said nozzle tip define an insulating airspace.

Claim 8 (original): An injection molding apparatus as claimed in claim 1, wherein said first guidance and alignment structure is removably connected to said valve pin.

Claim 9 (currently amended): [[9.]] An injection molding apparatus as claimed in claim 1, wherein said second guidance and alignment structure is removably connected to said mold block.

Claim 10 (currently amended): [[10.]] An injection molding apparatus as claimed in claim 1, wherein said second guidance and alignment structure is positioned in a gate insert that contains said gate and is removably connected to said mold block.

Claim 11 (currently amended): [[11.]] An injection molding apparatus as claimed in claim 1,

wherein said first guide surface curves gradually into said first alignment surface.

Claim 12 (currently amended): [[12.]] An injection molding apparatus as claimed in claim 1, wherein said second guide surface curves gradually into said second alignment surface.

Claim 13 (currently amended): [[13.]] An injection molding apparatus as claimed in claim 1, wherein said gate and said second guidance and alignment structure are defined in a gate insert that ~~connects to both~~ is removably connected to said nozzle body ~~and said mold block~~.

Claim 14 (currently amended): [[14.]] An injection molding apparatus as claimed in claim 1, wherein said manifold has a plurality of said manifold outlets, and has a plurality of said runners downstream from said inlet and upstream from said plurality of manifold outlets, and wherein said injection molding apparatus includes a plurality of said nozzles, wherein each nozzle is downstream from one of said plurality of manifold outlets, wherein said mold block defines a plurality of said mold cavities and defines a plurality of said gates into said plurality of said mold cavities,[[.]] and wherein said mold block and said nozzle tip and said seal piece on each said nozzle define one said chamber, and wherein said injection molding apparatus includes one said valve pin for each gate and one first guidance and alignment structure for each valve pin and one second guidance and alignment structure for each gate.

Claim 15 (currently amended): [[15.]] An injection molding apparatus comprising:

a nozzle body having a melt channel, said nozzle body being made of a first material;

a valve pin at least partially positioned in the melt channel, said valve pin having a

first guidance and alignment structure thereon;

a nozzle tip ~~connected to~~ in thermal contact with the nozzle body;

a seal piece ~~connected to~~ in thermal contact with the nozzle tip and the nozzle body; and

a mold gate insert having a gate, said mold gate insert being in contact with the seal piece;

wherein, the nozzle tip is made of a second material having a higher thermal conductivity than said first material,

wherein the seal piece is made of a third material having a lower thermal conductivity than said first material,

wherein the mold gate insert is made of a fourth material having a higher thermal conductivity than said third material, and

wherein the mold gate insert includes a second guidance and alignment structure ~~thereon~~ that contacts the first guidance and alignment structure before the valve pin contact the gate.

Claim 16 (currently amended): [[16.]] An injection molding apparatus as claimed in claim 15, wherein the nozzle tip has a nozzle tip guidance and alignment structure that contacts the first guidance and alignment during movement of the valve pin towards the gate orifice.

Claim 17 (currently amended): [[17.]] An injection molding apparatus as claimed in claim 15, wherein the nozzle tip is threaded to the nozzle body.

Claim 18 (currently amended): [[18.]] An injection molding apparatus as claimed in claim 15, wherein the seal piece is threaded to the nozzle body.

Claim 19 (currently amended): [[19.]] An injection molding apparatus as claimed in claim 15, wherein the seal piece retains the nozzle tip.

Claim 20 (currently amended): [[20.]] An injection molding apparatus as claimed in claim 15, wherein the first guidance and alignment structure ~~guiding portion~~ of the valve pin is ~~made of a separate piece~~ removably connected to said valve pin.

Claim 21 (currently amended): [[21.]] An injection molding apparatus as claimed in claim 15, wherein said ~~gate and said second guidance and alignment structure are defined in a~~ gate insert ~~that connects to both~~ is removably connected to said nozzle body ~~and said mold block~~.

Claim 22 (cancelled).

Claim 23 (new): An injection molding apparatus as claimed in claim 1, wherein the thermal conductivity of said nozzle tip is higher than the thermal conductivity of said nozzle body, and wherein the thermal conductivity of said seal piece is lower than the thermal conductivity of said nozzle body.

Claim 24 (new): An injection molding apparatus comprising:

a nozzle body having a melt channel;

a valve pin at least partially positioned in the melt channel, said valve pin including a first guidance and alignment structure, a second guidance and alignment structure and a first sealing surface;

a nozzle tip in thermal contact with the nozzle body and including a third guidance and alignment structure;

a seal piece in thermal contact with the nozzle tip and the nozzle body; and

a mold plate defining a mold cavity and a gate into said mold cavity, wherein said mold plate includes a fourth guidance and alignment structure and a second sealing surface;

wherein said first guidance and alignment structure of said valve pin is capable of interacting with said third guidance and alignment structure of said nozzle tip and said second guidance and alignment structure of said valve pin is capable of interacting with said fourth guidance and alignment structure of said mold plate so that said first sealing surface contacts said second sealing surface without contacting any other surfaces of said nozzle tip or said mold plate.

Claim 25 (new): The injection molding apparatus of claim 24, wherein said mold plate includes a gate insert, wherein said gate insert defines said gate, said fourth guidance and alignment structure, said sealing surface and at least a portion of said mold cavity.

Claim 26 (new): The injection molding apparatus of claim 25, wherein said gate insert contacts said seal piece.

Claim 27 (new): The injection molding apparatus of claim 25,wherein said gate insert is in thermal contact with said nozzle body.

Claim 28 (new): The injection molding apparatus of claim 25, wherein said seal piece is a first material and said gate insert is a second material having a higher thermal conductivity than said first material.

Claim 29 (new): The injection molding apparatus of claim 24, wherein said seal piece is a first material, said nozzle body is a second material having a thermal conductivity that is higher than said second material, and said nozzle tip is a third material having a higher thermal conductivity than said second material.